frequency control words are stored in the memory of microcomputer 37 rather than in separate frequency control registers as was discussed in connection with figure 4. The microcomputer 37 causes the crystal oscillator 1 to sequence through a series of modes of oscillation using control line 30 to squelch each oscillation before a new mode is initiated. Control line 28 is used in connection with switch 8 to remove the injection signal after oscillations have been established. The frequency of the VCXO 33 is compared with the frequency of the mode controlled crystal oscillator 1 during each mode of the latter. The frequencies of two of the modes compared to the VCXO frequency can be combined to obtain a measure of the ambient temperature since the temperature coefficients of the modes in the crystal oscillator 1 are all different. Information on the temperature characteristics of one of the modes can be prestored in the microcomputer memory and this, combined with the measure of the temperature, used to determine the actual frequency to the VCXO 33 at that temperature. A correction value for VCXO is then calculated by the microcomputer 37 and applied to the digital to analog converter 34 by way of control lines 38. The VCXO 33 then being kept on the desired frequency, is used as the output signal 39 from the temperature compensated crystal oscillator.

It should be noted that by utilizing a plurality of modes in crystal oscillator 1 it is possible to compensate for more than temperature, i.e. hysteresis effects, aging, etc. This is described in patent 6,545,550.

I Claim:

1. A crystal controlled oscillator which includes means for steering the frequency of oscillation to a particular mode of the crystal during the build up of oscillation by injecting a signal into the oscillator augmenting the noise energy available for oscillations to build up on the desired mode.

2. A crystal oscillator of claim 1 in which a frequency synthesizer which includes an independent frequency reference is used to produce a steering injection signal close in frequency to the desired mode.

3. The crystal oscillator of claim 2 in which the frequency synthesizer is fine tuned to reduce the build up time of oscillations by precisely positioning the injection signal at the anticipated resonance of the desired mode.

4. The crystal oscillator of claim 2 in which the independent frequency reference is a VCXO which was fine tuned by the mode steering crystal oscillator in the recent past.

5. The crystal oscillator of claim 2 in which the VCXO is temperature compensated using two or more modes of oscillation in the mode steering oscillator.

6. The crystal oscillator of claim 2 in which the frequency spectrum of the frequency synthesizer is broadened by modulating phase noise onto the output or sweeping the frequency.

7. The crystal oscillator of claim 1 in which an auxiliary oscillator is used to produce the mode steering injection signal.

8. The crystal oscillator of claim 1 in which the mode steering signal is removed after oscillations have saturated the oscillator on the desired mode of oscillation.

9. The crystal controlled oscillator of claim 1 in which initiation of oscillation and mode steering are delayed until the oscillator has reached the operating temperature if a crystal oven is used.

10. A crystal oscillator comprising a gain element that is frequency selective due to saturation at one frequency; a crystal resonator capable of being excited on different modes; a frequency synthesizer with an independent frequency reference generating an injection signal capable of encouraging oscillation on a desired mode.

11. The crystal oscillator of claim 10 in which the frequency synthesizer is broadened by modulating noise onto the output or by sweeping the frequency.